TITLE OF THE INVENTION:

METHOD AND MACHINE FOR PRODUCING A PACKAGE OF TOBACCO ARTICLES COMPLETE WITH A FOLDED COUPON

The present invention relates to a method and machine for producing a package of tobacco articles complete with a folded coupon.

The present invention may be used to particular advantage in the manufacture of packets of cigarettes, to which the following description refers purely by way of example.

It is fairly common practice to combine a packet of cigarettes with a respective coupon, which is normally located on the group of cigarettes inside the packet. The coupon may be the same size as or larger than the packet of cigarettes, and, if larger, is folded for insertion inside or application to the outside of the packet.

BACKGROUND OF THE INVENTION

A known packing machine for producing packets of cigarettes with respective folded coupons comprises a conveyor for feeding a number of seats, each supporting a respective group of cigarettes, along a packing path. The packing path extends through a feed station, where a

wheel with a number of gripping heads extracts the folded coupons one by one from the bottom of a stack housed inside a store, and feeds each folded coupon to a respective seat on a packing conveyor and onto the corresponding group of cigarettes.

Tests have shown that known packing machines of the type described above only operate satisfactorily at relatively slow speed (up to 4-5 packets of cigarettes a second), whereas high-speed operation (over 7-8 packets of cigarettes a second) is seriously impaired by the relatively long time involved in correctly withdrawing a folded coupon from the bottom of a stack of folded coupons.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method and machine for producing a package of tobacco articles complete with a folded coupon, designed to eliminate the aforementioned drawbacks, and which, in particular are cheap and easy to implement.

According to the present invention, there is provided a method of producing a package of tobacco articles complete with a folded coupon, as claimed in Claim 1 and, preferably, in any one of the following Claims depending directly or indirectly on Claim 1.

According to the present invention, there is provided a machine for producing a package of tobacco articles complete with a folded coupon, as claimed in Claim 11 and, preferably, in any one of the following

Claims depending directly or indirectly on Claim 11.

BRIEF DESCRIPTION OF THE DRAWINGS

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view in perspective of part of a cigarette packing machine in accordance with the present invention;

Figure 2 shows a front view of the part of the machine in Figure 1;

Figure 3 shows a side view of the part of the machine in Figure 1;

Figures 4 to 8 show larger-scale sections along lines IV-IV, V-V, VI-VI, VII-VII, VIII-VIII of details of the Figure 1 machine;

Figure 9 shows a view in perspective of a packet of cigarettes produced on the Figure 1 packing machine;

Figure 10 shows a larger-scale view in perspective of a cutting station of the Figure 1 machine;

Figures 11 and 12 show larger-scale front views of two instants in the operation of a cutting station of the Figure 1 machine;

Figure 13 shows a view in perspective of a different embodiment of a folding station of the Figure 1 packing machine.

Figure 14 shows a view in perspective of a further embodiment of a folding station of the Figure 1 packing machine;

Figure 15 shows a side view of the Figure 14 folding station;

Figure 16 shows a larger-scale view in perspective, with parts removed for clarity, of two details of the Figure 14 folding station, and a plan view of one of the two details.

DETAILED DESCRIPTION OF THE INVENTION

Number 1 in Figure 1 indicates as a whole a packing machine for producing rigid packets 2 of cigarettes. Figure 9 shows a detail of a packet 2 of cigarettes, which comprises a foil wrapping 3 containing a group of cigarettes (not shown in detail) and inserted inside a hinged-lid box 4. Packet 2 of cigarettes also comprises a respective folded coupon 5, which rests on a major lateral wall of box 4 and is made integral with box 4 by the interposition of glue or by a subsequent overwrapping of transparent plastic material (not shown). Alternatively, folded coupon 5 may be inserted inside box 4; in which case, folded coupon 5 rests on a major lateral wall of foil wrapping 3.

Packing machine 1 comprises a packing wheel 6 rotating continuously about a respective central axis (not shown) and having a number of peripheral seats 7, each for housing and supporting a respective packet 2 of cigarettes. As packing wheel 6 rotates, each seat 7 housing a respective packet 2 of cigarettes is fed through a feed station 8, where a transfer drum 9, having three suction gripping heads 10, feeds a respective

folded coupon 5 onto the packet 2 of cigarettes in each seat 7. More specifically, each seat 7 has known gripping means (not shown) for retaining respective folded coupon 5 on the corresponding packet 2 of cigarettes.

As shown in Figures 1 to 3, packing machine 1 comprises an unwinding device 11 for unwinding a flat strip 12 off a reel 13; a folding station 14 where the flat strip 12 unwound off reel 13 is folded over along a number of fold lines 15 parallel to the travelling direction of strip 12; and a cutting station 16 where the folded strip 12 is cut along a cutting line crosswise to the travelling direction of strip 12 to cut the folded coupon 5 off strip 12, after which, the folded coupon is engaged by the gripping head 10 cooperating with cutting station 16, and is fed to respective seat 7 on packing wheel 6.

At folding station 14 in the accompanying drawings, flat strip 12 is folded over along two fold lines 15 to a quarter of its original width. Generally speaking, however, flat strip 12 may be folded over at folding station 14 along any number of fold lines 15 to form a so-called "accordion" fold.

To make each fold in flat strip 12, flat strip 12 is run against a roller 17 having a V-shaped lateral surface, so as to be first folded into a V along a fold line 15; and the V-folded strip 12 is then fed between two rollers 18, which cooperate with each other to complete the fold along fold line 15. More specifically,

roller 17 is fitted to a respective frame 19 to rotate freely about an axis 20 crosswise to the travelling direction of strip 12.

Downstream from folding station 14 is located a drive device 21, which comprises two rollers 22 cooperating with each other, and between which the folded strip 12 is fed; one of rollers 22 is idle, while the other roller 22 is powered to impart a given motion to folded strip 12. Downstream from drive device 21 is located a further drive device 23, which comprises two rollers 24 cooperating with each other, and between which the folded strip 12 is fed; one of rollers 24 is idle, while the other roller 24 is powered to impart a given motion to folded strip 12.

Between the two drive devices 21 and 23 is interposed a compensating device 25, which, by means of suction, forms a bend 26 of variable length in folded strip 12.

In actual use, drive device 21 is controlled to impart a substantially constant speed to strip 12 unwound off reel 13, and so feed strip 12 continuously to folding station 14; whereas drive device 23 is controlled to impart a cyclically varying speed to strip 12, and so feed strip 12 in steps to cutting station 16. The length of bend 26 is varied constantly to cyclically zero the speed of strip 12 at cutting station 16, so that strip 12 can be fed in steps to cutting station 16.

Cutting station 16 comprises a fixed anvil 27 and a

movable cutting member 28 located successively in the travelling direction of strip 12. Anvil 27 has a face 29 positioned contacting strip 12 and having a cutting edge at the end facing cutting member 28; and cutting member 28 comprises a plate 30, which is mounted to oscillate about a respective axis 31 crosswise to the travelling direction of strip 12 under the control of an actuating device 32, and has, at the end facing anvil 27, a cutting edge complementary to the cutting edge of anvil 27.

Transfer drum 9 rotates continuously about a respective central axis 33 parallel to axis 31, and comprises three arms 34, which are equally spaced along the periphery of transfer drum 9, are fitted to transfer drum 9 to oscillate with respect to transfer drum 9 about respective axis 35 parallel to axis 33, and support gripping heads 10.

In actual use, for each complete back and forth oscillation about axis 31, plate 30 cuts a folded coupon 5 off folded strip 12 by cutting along a cutting line crosswise to the travelling direction of strip 12. As it is being cut off, folded coupon 5 is engaged by a respective gripping head 10 and then fed to a corresponding seat 7. For which purpose, the arm 34 supporting gripping head 10 is oscillated about respective axis 35 to keep gripping head 10 in substantially stationary contact with plate 30. More specifically, when cutting folded strip 12, plate 30 (defining a cutting knife) and respective gripping head

10 are oscillated, in time with each other, about substantially the same axis coincident with axis 31, and with concordant, substantially equal movements to keep plate 30 and gripping head 10 substantially contacting each other, with the folded coupon 5 just detached from folded strip 12 in between.

As stated, at folding station 14, to form each fold in strip 12, strip 12 is first folded into a V along a fold line 15, and the V-folded strip 12 is then fed between two rollers 18 cooperating with each other to complete the fold along fold line 15.

In a preferred embodiment shown in Figure 13, strip 12 is first folded into a V by running it against a fixed triangular folding edge 36. This solution is generally preferable to rollers 17 by being cheaper and easier to implement, while producing the same results. More specifically, folding edge 36 is flat and in the form of an isosceles (or possibly equilateral) triangle having a base 37 perpendicular to the travelling direction of strip 12, and the vertex 38, opposite base 37, facing fold line 15.

Figures 14 and 15 show a different embodiment of folding station 14. To form each fold in strip 12, strip 12 is run against a folding profile 39 (shown in detail in Figure 16, in which strip 12 is not shown) having a folding edge 40, which slopes at a given angle of normally 10° to 30° with respect to the travelling direction of strip 12, and therefore with respect to the

fold line 15 along which strip 12 is to be folded. Folding profile 39 is shaped to have, in the travelling direction of strip 12, a varying transverse dimension, which equals that of the non-folded strip 12 at an initial portion 41, and is gradually reduced, by the slope of folding edge 40, to a transverse dimension, at an end portion 42, equal to half the transverse dimension of strip 12 (i.e. the transverse dimension of the folded strip 12). A deflecting member 43 holds strip 12 in contact with end portion 42 at folding edge 40, so as to force strip 12 to fold gradually about folding edge 40 along the whole length of folding profile 39, until it is eventually folded in half along respective fold line 15 at end portion 42 of folding profile 39.

End portion 42 of folding profile 39 preferably extends a given length in the travelling direction of the strip, with a constant transverse dimension equal to half the transverse dimension of the non-folded strip 12 (i.e. equal to the transverse dimension of the folded strip 12), and has a change in slope (44) at the part contacting deflecting member 43.

In other words, strip 12 is folded about folding profile 39 so that folding profile 39 is enclosed between the two halves of strip 12; one half of strip 12 contacts a top surface 45 of folding profile 39; and the other half of strip 12 is gradually brought into contact with a bottom surface 46 of folding profile 39 parallel to and opposite top surface 45.

A guide or swerve-inhibiting device 47 is preferably provided to keep the portion of strip 12 not being folded laid flat in a given position on top surface 45 of folding profile 39. More specifically, guide device 47 comprises a perforated belt 48 looped about two end pulleys 49 and 50 and connected to a suction chamber 51 for generating suction through belt 48. Pulley 49 is powered to rotate in time with the travelling speed of strip 12, while pulley 50 is idle. Pulley 49 is preferably also used as a return pulley for strip 12. In an alternative embodiment, both pulleys 49 and 50 are mounted idly to rotate freely about respective central longitudinal axes, and pulley 49 is designed and located to also define a return pulley of strip 12 and therefore to be rotated by strip 12 itself.

In actual use, perforated belt 48 advances at the same speed as strip 12, engages the contacting strip 12 by suction, and so keeps the portion of strip 12 not being folded laid flat in a given position on top surface 45 of folding profile 39 to prevent strip 12 from swerving, and also prevent the formation of wrinkles or creases.

In the embodiment shown, deflecting member 43 is defined by a roller mounted idly to rotate freely about a respective longitudinal axis of symmetry. In an alternative embodiment, deflecting member 43 is defined by a fixed drum.

A known suction-type compensating device 52 is

preferably provided immediately downstream from reel 13 (and therefore upstream from folding station 14) to form a bend of varying length in strip 12, and so compensate, with no damage, for any sharp changes in the tension of strip 12 caused by folding station 14.